



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 91, 97, 121, 125, 129, and 135

Docket No. FAA-2011-1082

Proposed Provision of Navigation Services for the Next Generation Air Transportation System (NextGen) Transition to Performance-Based Navigation (PBN); Disposition of Comments

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed policy; disposition of comments.

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SUMMARY: On December 15, 2011, the FAA published a Federal Register Notice (76 FR 77939) requesting comments on the FAA's plans for providing PBN services, and particularly the transition from the current Very High Frequency Omnidirectional Ranges (VOR) and other legacy navigation aids (NAVAIDS) to Area Navigation (RNAV)-based airspace and procedures. This action responds to the public comments the FAA received.

ADDRESS: You may review the public docket for this notice (Docket No. FAA-2011-1082) at the Docket Management Facility at DOT Headquarters in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue SE, Washington, DC 20590-0001 between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. You may also review the public docket on the Internet at <http://www.regulations.gov>.

FOR FURTHER INFORMATION CONTACT: Mr. Greg Joyner, AJM-324, Program Management Organization, Navigation Program Engineering, Federal Aviation Administration, 800 Independence Avenue SW, Washington DC 20591: telephone 202-493-5721.

SUPPLEMENTARY INFORMATION:

Summary of the December 15, 2011 FRN

The FAA sought comments on the proposed transition of the U.S. National Airspace System (NAS) navigation infrastructure to enable PBN as part of the NextGen. The FAA plans to transition from defining airways, routes and procedures using VOR and other legacy NAVAIDS, to a NAS based on RNAV

everywhere and Required Navigation Performance (RNP) where beneficial. RNAV and RNP capabilities will primarily be enabled by the Global Positioning System (GPS) and the Wide Area Augmentation System (WAAS). The FAA plans to retain an optimized network of Distance Measuring Equipment (DME) facilities and a Minimum Operational Network (MON) of VOR facilities to ensure safety and support continued operations in high and low altitude en route airspace over the Conterminous United States (CONUS) and in terminal airspace at the Core 30 airports. The FAA is also conducting research on non-GPS based Alternate Positioning, Navigation and Timing (APNT) solutions that would enable further reduction of VORs below that of the MON.

In addition, the FAA plans to satisfy any new requirements for Category I (CAT I) instrument landing operations with WAAS Localizer Performance with Vertical guidance (LPV) procedures. A network of existing Instrument Landing Systems (ILSs) will be sustained to provide alternative approach and landing capabilities to support continued recovery and dispatch of aircraft during GPS outages.

This transition is consistent with the FAA's NextGen Implementation Plan (NGIP), NAS Enterprise Architecture (NASEA), and other documentation. More information is available on the FAA's NextGen Web site at <http://www.faa.gov/nextgen> and the NASEA Web site at <https://nasea.faa.gov>.

#### Discussion of Comments Received

##### Summary

The FAA received 330 comments on the FRN. Commenters include aircraft manufacturers, airline operators, individuals, and associations representing users, airports and several federal, state and local government organizations. Most comments were supportive of the evolution of the NAS to an RNAV based system, but a significant number of commenters were concerned about reliance on GPS and WAAS related to possible impacts of interference or disruption, as well as the requirements and costs of avionics. A number of commenters were concerned about loss of approach services at specific airports in the event of discontinuation of service from specific VOR facilities. A substantial number of the comments (185) received were from individuals concerned about noise and

environmental impact in the New York metropolitan area. Some reflected concerns about aircraft emissions and flight paths used by helicopters. These comments have been forwarded to the FAA Eastern Region for action.

#### Discussion

The FAA has reviewed all the comments received in response to the FRN and plans to proceed with the strategy as outlined in the FRN. The FAA is developing an initial VOR MON Plan, which will be publicly available when it is sufficiently matured. Development of this Plan will harmonize with development of a national Concept of Operations (CONOPS) supporting navigation and positioning in the NAS as it evolves from conventional navigation to PBN. When completed, this CONOPS will also be publicly available.

As part of the coordination process, the FAA plans to develop a schedule showing the requisite activities associated with the discontinuance of VOR services. These activities will include timely notification for individual facilities and airspace and procedure redesign.

Comment # 1: Several commenters (International Air Traffic Association (IATA), Boeing Commercial Airplanes, National Association of State Aviation Officials (NASAO), Aircraft Owners and Pilots Association (AOPA), Department of Defense (DoD), and Airlines For America (A4A)) expressed interest in being included in the working group that the FRN indicated would be formed to complete the details of VOR discontinuance. Some airlines commented that they would like to be consulted on the policy.

FAA Response: *The FAA will convene a working group that will engage aviation industry stakeholders and other members of the public for input once the Program has reached a sufficient level of maturity conducive to working group.*

Comment # 2: NASAO commented that planning the transition to NextGen PBN well in advance would be beneficial to the FAA and the state government aviation agencies.

FAA Response: *The FAA's VOR MON plan is proceeding to support transition to NextGen PBN in accordance with the NASEA. The NGIP, FRN and NASEA, all publicly available via FAA websites, are integral to the transition of the NAS to PBN operations.*

Comment # 3: The Nebraska Department of Aviation (DoA) recommended that VORs remain available as a viable means for air navigation while the services to support NextGen PBN be provided for users that can obtain benefits from them during a transition.

FAA Response: *The VOR MON will remain in place during the PBN transition.*

Comment # 4: Nebraska state-owned VORs, similar to the FAA inventory of Second Generation VORs, are maintained by the State, who reports there have been no problems with support cost or availability of parts.

FAA Response: *VOR facilities not owned or operated by the FAA are not being considered for discontinuance.*

Comment # 5: Operators that fly outside the United States desired clarification on the GNSS reference to be used.

FAA Response: *The FRN used the terms GPS and WAAS, the specific U.S. implementations of the GNSS and Space Based Augmentation System (SBAS) described in ICAO Annex 10. Other countries have, or are building systems that implement these standards, such as Europe's GNSS (Galileo) and SBAS (European Geostationary Navigation Overlay Service (EGNOS)). Since the U.S. does not make regulatory determinations on navigation systems allowed in other countries, the U.S. cannot authorize use of GPS in other countries. The FAA is responsible for determining which services are adequate for operations in the U.S. NAS, and has, to date, only approved the use of the U.S.' GPS and WAAS, and Russia's Globalnaya Navigatsionnaya Sputnikovaya Sistema (GLONASS) on a supplemental basis. The U.S. is working with other GNSS providers to assure that their signals may be used to improve performance in the U.S. when those signals become available. Plans for navigation services will continue to use specific references (e.g., GPS and WAAS) and policies will be updated as additional constellations are approved for use in the U.S. The ability of avionics to use different GNSS constellations and services depends both on the authorized equipment available for specific aircraft and the type of systems the operators decided with which to equip their aircrafts. It also depends on what avionics manufacturers decide to develop. FAA's plans for navigation services will continue to use the "GPS" and "WAAS" terms so that it is clear*

*that the U.S. is referring to U.S. systems/services for the U.S. NAS. Text describing this reasoning will be included in future documents to help ensure clarity.*

Comment # 6: Some users stated that they either will not equip with GPS avionics or will not be flying in airspace that requires ADS-B. The Nebraska DoA stated that many pilots and users do not plan to equip aircraft with GPS and that instructors will still require students to learn VOR navigation.

FAA Response: *Pilots may continue to use VORs that remain in the MON or fly under Visual Flight Rules (VFR) in non-ADS-B airspace. Instructors will still teach VOR navigation.*

Comment # 7: Operators and some aircraft and equipment manufacturers stated that they did not intend to equip with WAAS because (1) WAAS service is not provided in many parts of the world outside the United States, and (2) many air carrier aircraft are equipped with avionics that allow at least RNAV, if not some level of RNP, and they do not believe WAAS provides benefits commensurate with the added complexity and cost involved with equipage.

FAA Response: *WAAS avionics (Technical Standard Order (TSO)-C145/146) with suitable other avionics, such as Flight Management Systems (FMS) support LPV and Lateral Navigation/Vertical Navigation (LNAV/VNAV) terminal procedures and lower minima instrument approaches that are not available to users equipped with non-augmented GPS (TSO-C129 and C196) avionics. Pilots may continue to use non-augmented GPS or other RNAV capabilities as described in FAA advisory circulars AC 90-100, AC 90-101, AC 90-105, AC 90-107 and other directives.*

Comment # 8: Federal Express stated that the FRN described implementation of PBN based on GPS and WAAS backed up by a minimum network of VORs and DMEs, which it stated would require equipage of aircraft with avionics that is not offered by major airline airframe manufacturers.

FAA Response: *While the FAA intends to reduce the VOR infrastructure to a MON, it will maintain an optimized DME network to support RNAV operations throughout the NAS. In the NextGen timeframe, an optimized DME network could be used to support APNT.*

Comment # 9: The DoD was concerned about discontinuation of service from all types of ground based navigation aids. The concept and planning described in the FRN does not contemplate discontinuation of service from all ground based navigation aids. It describes the considerations for determining the discontinuation of service by VOR ground based navigation aids. Where the VOR functionality is collocated with DME or DME and UHF azimuth equipment (which is the Tactical Air Navigation or TACAN), the FRN only addresses the VOR service and not these other services.

FAA Response: *The MON described in the FRN is a network of VORs only, and does not include TACAN. Retention of DMEs and the DME function provided via TACAN is desirable because of the large proportion of the air carrier fleet that uses DME/DME or DME/DME/Inertial Reference Unit (IRU) for RNAV. Any national discontinuation of DME or TACAN service is separate from the VOR MON, not a part of this activity, and not contemplated in the near future.*

Comment # 10: Some organizations (IATA, United Air Lines, FedEx, Honeywell, Thales, and A4A) expressed concern about the future of ILSs and other vertically guided approaches, in particular at 14CFR Part 139 airports serving air carriers.

FAA Response: *The FAA has no current plans to remove ILSs, but most new vertically guided approach requirements using Facilities and Equipment funding will be fulfilled with LPV approaches. ILS can continue to be approved under Airport Improvement Program (AIP) funding. While LPVs will receive increasing emphasis for projects funded under the AIP, the needs of users for ILS equipment will be considered in the determination of the types of approach navigation installed under the AIP. It is envisioned that many air carrier runways at major airports will continue to be supported by ILS (in addition to LPV). Additionally, the FAA plans to continue to develop LNAV/VNAV approaches, which can be flown by GPS-equipped aircraft with barometric vertical navigation and by WAAS-equipped aircraft to qualified runways used by air carrier aircraft. RNP approaches will be developed where beneficial, and GLS approaches will be developed as appropriate at airports with access to GBAS equipment.*

## APNT

The FAA's NextGen Alternate PNT (APNT) program ensures that alternate PNT services will be available to support flight operations, maintain safety, minimize economic impacts from GPS outages within the NAS and support air transportation's timing needs. APNT will be an alternative for all users. Avionics equipage is a major consideration. APNT requirements will be met with the optimum use of existing avionics. The current plan is for APNT equipage to be optional.

Comment # 11: The airline industry voiced support for an increase in DME to provide additional coverage for DME-DME navigation provided by modern Flight Management Systems (FMS).

FAA Response: *The FAA concurs. Current planning is for implementation of the new DME sites beginning in 2014. The FAA goal is to have complete DME-DME coverage enroute at FL 180 and above throughout CONUS and in the terminal area of large airports in the CONUS.*

Comment # 12: The airline industry was concerned about a statement in the FRN that seemed to indicate that WAAS was required for ADS-B.

FAA Response: *WAAS is not required for ADS-B. Other methods of meeting the performance requirements are being investigated. ADS-B implementation in international operations will require use of regionally or globally available services.*

Comment # 13: IATA stated implementation of any new technology should be driven by coordinated operational requirements of stakeholders. The International Civil Aviation Organization PBN Manual (Document 9613) was cited by IATA in describing the steps that must be followed in implementing PBN, and states the FAA may not have followed the described process. IATA then related the plan described in the FRN to the ADS-B Out regulations at 14 CFR 91.225 and 91.227 and the implied SBAS mandate and provides comments on the implementation and the requirements that it states are very different from European requirements to obtain the same performance with simpler equipage. IATA states they do not support use of any SBAS systems such as WAAS and desires to be consulted on revision of the VOR MON and alternate positioning,

navigation and timing and systems, such as eLORAN, Galileo and others. IATA does not support the use of LPV approaches as a universal solution and requires an adequate number of precision approaches be maintained to provide capacity without GNSS. IATA states GBAS and Baro VNAV approaches should be published to complement LPV approaches at airports used by international carriers. IATA does not want PBN levels to be specified that require augmentation unless they are operationally required.

FAA Response: *FAA will engage stakeholders via the working group in implementing the MON. PBN transition strategy is currently being developed within the FAA. The FAA will not mandate WAAS. PBN can be achieved by multiple means, such as DME/DME and ILS. GBAS is currently in the Research & Development phase.*

Comment # 14: Boeing Commercial Airplanes was concerned about the interpretation text for the operational requirements for two independent systems (reference 14 CFR 121.349, 125.203, 129.17 and 135.165). Specifically, they questioned the statement that the requirements for a second navigation system apply to the entire set of equipment needed to achieve the navigation capability, not just the individual components. They are concerned that this statement could be interpreted as requiring dual independent navigation computers. Additionally, they state that existing, certified multi-sensor navigation systems under AC 20-130A can meet the proposed policy requirements.

FAA Response: *The text does not imply the need for dual independent navigation computers. The text instead emphasizes the need for independence of the navigation systems and their components to ensure that there will be no potential single point of failure or event that could cause the loss of the ability to navigate along the intended route or proceed safely to a suitable diversion airport. The interpretation of this requirement as applied to an aircraft approved for multi-sensor navigation and equipped with a single FMS is that the aircraft must maintain an ability to navigate or proceed safely in the event that any one component of the navigation system fails, including the FMS. Retaining an FMS-independent VOR capability would satisfy the*

requirement, even as the NAS is transitioned to the MON. This interpretation corresponds to the advisory wording in AC 20-130A.

Comment # 15: The Maryland Aviation Administration (MAA) expressed concern about current GPS equipage rates.

FAA Response: Though approximately 19 percent of all general aviation aircraft are equipped with aviation-qualified GPS, most aircraft that actually file IFR flight plans are typically equipped with GPS. Specifically, more than 72% of aircraft that filed at least two IFR flight plans in 2011 filed with an equipment code indicating they had IFR GPS receivers on board. Of aircraft that filed more than 100 IFR flight plans in a year the rate was above 97%. While it may be the case that a significant number of aircraft flying VFR are not equipped with GPS, the purpose of the VOR system is to provide navigation for aircraft flying IFR, not VFR. VFR traffic is permitted to use hand-held and non-IFR certified GPS equipment for situational awareness as an aid to navigation and often use pilotage and dead reckoning navigation. While the VORs retained in the MON will support VFR aircraft operations, their purpose is clearly to support those aircraft operating under IFR.

Comment # 16: Two commenters (the Nebraska DoA and Thales) were concerned over the impact that a reduction in VORs would have on training and training requirements.

FAA Response: The current training standards for the FAA emphasize VORs as the primary navigation source. The transition to NextGen will require that the FAA shift emphasis from VOR navigation to satellite-based navigation by changing training syllabi and the PTS. However, some emphasis will need to remain on VOR and ILS to ensure that pilots can navigate using these systems in the event of a GPS outage. These considerations will be included in the FAA's plan for discontinuance of VORs. Additionally, transfer of FAA-owned VORs not selected to be in the MON to operation under non-Federal ownership for training may be considered on a case-by-case basis.

Comment # 17: The Nebraska DoA and Thales were also concerned with airport infrastructure requirements resulting from development of RNAV or RNP approaches.

FAA Response: *FAA airport infrastructure requirements resulting from instrument approaches are published in FAA Advisory Circular 150/5300-13. Because airport infrastructure upgrades may be required for the attainment of lowest instrument approach minima, collaboration with local and state officials will be accomplished during the approach development process. For example, development of an LPV approach could not be accomplished if the required runway length were not available. However, if a decision was made in collaboration with local and state officials, to extend the runway, then an LPV could be reconsidered.*

Comment # 18: *United Air Lines and GE Aviation expressed concern on the use of GPS approach capability by air carriers at alternate airports.*

FAA Response: *Current FAA policy allows operators of aircraft equipped with WAAS to plan for RNAV (GPS) approaches to the LNAV line of minima at their alternate. Furthermore, the FAA is currently investigating what requirements will be necessary to allow un-augmented GPS (TSO-C129/-C129a, TSO-C196/-C196a) equipped aircraft to plan for RNAV (GPS) or RNAV (RNP) approaches at alternate airports.*

Comment # 19: *Several commenters expressed concern that the navigation transition strategy as outlined in the FRN is indirectly requiring certain types of equipage, specifically GPS or WAAS equipage.*

FAA Response: *The FAA is committed to the use of performance-based operations in the NAS. They remain the optimal way to both enable technological advances while maintaining safety, efficiency and consistency. Therefore, it is not the intention of the FAA to limit operational approvals to specific technologies or to force retrofit navigation solutions on current operators with legacy equipment. VOR navigation will continue to be a viable option for airspace users for the near future. Once the FAA completes implementation of the VOR MON, VOR navigation will still serve the NAS, albeit in a less robust fashion than today. Early publication of transition considerations and planning will allow users to consider long-term equipage strategies for their aircraft. Operators are encouraged to continue to seek approvals for the use of navigation equipment that was emphasized in the FRN, e.g. DME/DME/IRU, GPS,*

and WAAS. The FAA will continue to work with industry to advance new technologies not yet matured, e.g., GBAS and APNT. Additionally, the FAA will continue to work with our international partners on global strategies for multi-constellation/multi-frequency GNSS solutions.

Comment # 20: AOPA and the National Business Aviation Association (NBAA) both expressed support for direct routing and avoiding excessive implementation of additional T and Q routes.

FAA Response: *In the NextGen environment, T and Q routes increase capacity and efficiency while maintaining safety by minimizing impact to air traffic control. T and Q routes allow controllers to safely manage air traffic during peak periods and to ensure predictable transitions between busy traffic areas. T and Q routes overlaid on existing airways defined by VORs could mitigate potential impacts to the discontinuance of VOR navigation services.*

Comment # 21: Comments from military and general aviation expressed interest in participating in VOR discontinuation planning.

FAA Response: *As stated in the FRN, "The FAA will convene a working group that will develop a candidate list of VORs for discontinuance using relevant operational, safety, cost and economic criteria. As part of the process, this working group will engage aviation industry stakeholders and other members of the public for input." Detailed planning for the implementation of the MON is still under development. As the program planning process is further developed, the FAA will solicit input from government and industry stakeholders before the VORs selected for the MON are finalized.*

Comment # 22: Several commenters (MAA, Boeing Commercial Airplanes, United Air Lines, AOPA, Thales and DoD) indicated that an overall plan is necessary and requested more detail on the MON. MAA commented that without a national plan for discontinuation, the removal of specific VORs from service might be premature. They believed that several VORs in Maryland are currently planned for discontinuance and they suggested that the discontinuation of specific facilities should be considered on both a regional and national level using analysis to identify costs and benefits in a more holistic manner to make the consideration of facilities objective and consistent.

FAA Response: *The FAA has not developed a final list of VORs that will be included in the MON. The FAA is developing objective criteria, which will be applied consistently both nationally and regionally to help identify those VOR facilities that will remain operational. A specific overall national CONOPS and discontinuance plan are being developed to support this effort. The draft CONOPS and draft discontinuance plan will be presented to stakeholders, and the FAA will engage stakeholders in the discontinuance process.*

Comment # 23: Military and airline industry commenters expressed concern with the FAA plan to establish the VOR MON by January 1, 2020.

FAA Response: *This date coincides with the January 1, 2020 mandate for ADS-B equipage. Once aircraft are equipped with ADS-B, it is assumed that they will be equipped with GPS as well, since currently GPS is the only known position source that can satisfy the NIC/NAC/SIL requirements of ADS-B. At that time, the VOR MON will serve as the required GPS backup for non DME-DME equipped aircraft in the event of a GPS outage. By January 1, 2020, the VOR MON will provide sufficient VOR coverage to enable aircraft to fly VOR-to-VOR either through the GPS outage or to a safe landing.*

Comment # 24: A number of operators, service providers and equipment manufacturers were concerned about the level of reliance on GPS expressed in the FRN in light of possible interference with the GPS service. Interference on a regular basis from government testing and training was specifically identified, as was possible widespread interference from licensed operators as well as unintentional interference from a variety of human and natural sources. There remains a concern among users that GPS is susceptible to interference and VORs should remain as a cost effective reliable means of navigation.

FAA Response: *U.S. National policy recognizes the vulnerability of GPS signals, from both human and natural sources, and requires operations reliant on GPS position, navigation, and timing (PNT) for safety, security, or significant economic benefit to have sufficient backups in place. The FAA has operated and will continue to operate GPS-independent systems to fulfill this requirement, such as ILS, DME, and VOR. As the NAS transitions to NextGen,*

there is also a requirement to move from conventional facility based navigation to point-to-point navigation using PBN, a role that the airways supported by VORs cannot support. The FAA will continue to operate a subset of the current VOR facilities in a MON to support those aircraft not equipped with GPS-independent RNAV capability, while developing an RNAV-capable APNT system to fulfill this role in the future. DoD Interference with GPS: The FAA recognizes the need for DoD elements as part of their mission to operate and conduct training in a GPS-denied environment. Both the FAA and DoD are committed to working together to ensure that the DoD mission will not impact the FAA's mission to operate a safe and efficient NAS. DoD GPS interference testing is fully coordinated with the FAA and prior to testing, the FAA issues a Notice to Airmen (NOTAM) that describes the potential extent of interference and the timeframe in which it might occur. During testing the FAA maintains direct communications with DoD at all times and can have tests suspended in the event of any impact to NAS operations.

Today, aircraft with non-GPS RNAV avionics are not impacted by this interference, and in the future, all APNT-equipped aircraft will similarly be unaffected.

Comment # 25: Comments were received relative to several specific VORs with reasons for their specific retention. In the case of the Wichita, KS VOR (ICT), it was stated that the facility is needed for testing and airworthiness demonstration of new manufactured aircraft by a number of companies in the area.

FAA Response: While a VOR signal is necessary for this activity, it is not necessary that the service be provided by a FAA owned VOR, whose purpose under the MON will be to ensure safe operations in the event of a GPS outage. A non-Federal VOR, owned by an airport authority, state instrumentality or private entity could also perform this function. In cases where individuals/organizations have an interest in maintaining a specific VOR service, the VOR could be transferred to and operated under agreement with the FAA as a non-federal facility.

Comment # 26: Thales expressed a concern over how the VOR MON will support non-GPS aircraft and GPS aircraft during GPS interference if a key MON VOR is down for maintenance.

FAA Response: *In determining the VORs that will make up the MON, consideration will be given to the availability and continuity of navigation service expected from each facility. The VOR MON's purpose, a non-PBN backup in the event of a GPS outage, will be considered in making this determination. An element of this consideration will be the availability of non-GPS dependent surveillance services that would allow air traffic to provide services in the event of both a GPS and individual VOR service outage. Additionally, the equipage rate of IFR traffic with IFR GPS is significant and expected to be near 100% as we approach the year 2020 ADS-B mandate. While possible to fly IFR using the VOR MON, the increased distance of the VOR-only route as compared to using RNAV navigation will likely be highly undesirable. This will further drive GPS equipage.*

Comment # 27: The DoD stated concern on the cost of transition versus benefits for their fleet of aircraft.

FAA Response: *The NAS' transition to NextGen is a national priority, in which the FAA plays an important role in concert with other Federal agencies and the aviation community. The transition to PBN as enabling capability for NextGen is a key part of the NGIP. Additionally, the considerations of the military in transitioning a 14,600 aircraft fleet and operating practices to RNAV/RNP stated in comments to the public docket appear to include the notion that TACAN services from VORTAC facilities will be terminated when VOR service is discontinued. This is not the case. The military also desires the FAA to retain VOR and TACAN service for specific enroute and terminal locations and procedures as the military aircraft fleet equipage and operating procedures evolve.*

*The FAA notes that there is historic precedent for the transition to a single national system - specifically the establishment of VORs and associated airways, DME, and ILS in the 1950s. At that time the military did not want to equip with VOR or ILS in tactical aircraft due to weight and space*

constraints, stating that Non-Directional Beacons (NDB) and four course ranges for enroute navigation and ground controlled approach (GCA) for landing was sufficient pending implementation of TACAN. The military also wanted to evolve to use TACAN because of weight/size and operational advantages over VOR and to include their implementation of DME, rather than the civil DME standard. The civil community, particularly airlines, wanted VOR for improved accuracy and usability over four course ranges and NDBs with ILS for approaches. In the end the NDBs and four course ranges were retained until military aircraft and operating practices transitioned to TACAN, the military DME standard was adopted for all DMEs and ILS was standardized for approaches, though the military continued GCA approaches, particularly for tactical aircraft.

The transition to RNAV/RNP may be undertaken economically for military aviation by retaining TACAN as a system, discontinuing only specific facilities on an individual basis; incorporating military use considerations for identifying VOR service for discontinuation in enroute and terminal environments; designating special use airspace and other military usage features with RNAV references as well as TACAN or VOR rho/theta and distance references; and retaining ILS at current sites with installation of new ILSs by military where needed in lieu of LP and LPV.

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Issued in Washington, DC, on August 14, 2012.

Lansine Toure,

Acting Manager, Navigation Programs.

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